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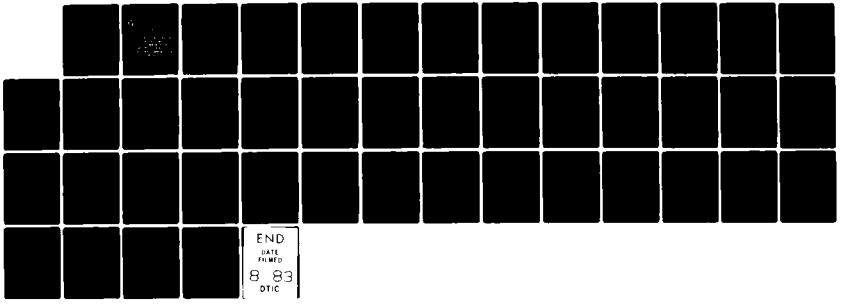

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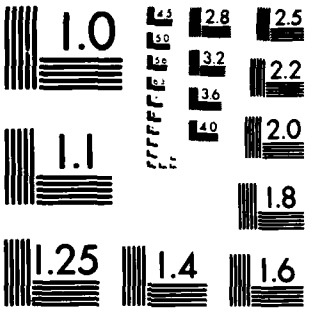

NCS TIB 83-2

NATIONAL COMMUNICATIONS SYSTEM

TECHNICAL INFORMATION BULLETIN 83-2

RELEVANCE OF NATIONAL AND INTERNATIONAL TELECOMMUNICATION STANDARDIZATION ACTIVITIES TO NATIONAL COMMUNICATIONS SYSTEM OBJECTIVES

APRIL 1983

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The purpose of this technical information bulletin is to describe the major international and national standards development organizations and their objectives. This document also illuminates the relationship of these organizations to the U.S. Government's Federal Telecommunications Standards Program (FTSP) managed by the National Communications System.

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FOREWORD

(International Telegraph and Telephone Consultative Committee)

This Technical Information Bulletin describes the linkages between the objectives of the principal national and internationl telecommunication standards development organizations and those of the U.S. Government's Federal Telecommunication Standards Program (FTSP). In the process it is shown that the categories of standards to promote interworking of the national telecommunication networks of the various countries of the world, which the CCITT in particular must develop, are the same ones needed to satisfy the interoperability objectives of the FTSP among networks of the various Federal agencies. Finally the point is made that the NCS, in managing the FTSP, must continue to exploit the similarities in objectives by pro-active participation in selected national and international standards development groups. Such participation is necessary to ensure insofar as possible that national and international standards emerging from these organizations are timely and responsive to Federal government needs so that the benefits of uniform Federal and national standards may be realized.

Comments on the contents of this document, including any significant omissions, are welcome and will receive careful consideration in the next revision. Comments should be addressed to:

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SECTION I

OVERVIEW

The purpose of this technical information bulletin is to describe the major international and national standards development organizations, and their objectives. This document also illuminates the relationship of these organizations to the U.S. Government's Federal Telecommunication Standards Program (FTSP) managed by the National Communications System (NCS).

The international standards development organizations include the International Telecommunication Union (ITU) and the International Organization for Standardization (ISO). These organizations provide standards across a broad range of telecommunications and information processing fields. Telecommunications interworking between national communication networks is the primary concern of the ITU. ISO is developing standards for communications between information systems and processes. The NCS is concerned with the efforts of both organizations. To exploit the similarities in the objectives of these organizations and the objectives of the FTSP, NCS will continue to participate in the standards activities sponsored by these international organizations.

On the national level, NCS participates in various standards development activities sponsored by industry organizations. These recognized standards bodies include the Electronic Industry Association (EIA), the American National Standards Institute (ANSI) (the U.S. representative in ISO), and the Institute of Electrical and Electronics Engineers (IEEE). National organizations provide the backbone of development activities for the international organizations. Much of the standards work in process today was initiated and is being pursued at the national level prior to introduction on the international level.

The NCS believes that standards emerging from both the international and national levels are timely and responsive to the needs and objectives of the FTSP and the Federal government. In addition, NCS believes that active participation in the standards process will help to shape the resulting standards in the best interests of the U.S. Government as well as to produce uniform Federal and national standards.

SECTION II

THE NATIONAL COMMUNICATIONS SYSTEM

The National Communications System (NCS) was established on August 21, 1963, by Presidential Memorandum entitled "Establishment of the National Communications System." The Secretary of Defense is designated as Executive Agent with the mission "to ensure that the most critical telecommunications needs of the Federal Government can be met in any anticipated emergency situation while, at the same time, achieving the most economical fulfillment of the day-to-day telecommunication requirements."

Policy direction for the development of the NCS stems directly from the National Security Council as set forth by Executive Order 12046, dated March 27, 1978, and Presidential Directive/NCS-53, subject: "National Security Telecommunications Policy," dated November 15, 1979. National Defense and Emergency Preparedness Telecommunications responsibilities of the NCS were identified in the July 5, 1978, White House Memorandum to all Federal departments and agencies. Functioning within the guidance provided by the National Security Council, the Executive Agent is responsible for ensuring that unified operations and technical planning are conducted to afford a highly effective and responsive communications system to meet the needs of the Federal Government.

The Secretary of Defense has designated the Director of the Defense Communications Agency (DCA) to serve as the Manager of the NCS. The Executive Agent functions delegated to the Manager, NCS include coordination, planning, standards, test, and evaluation.

The NCS is a confederation of certain Federal agencies that participate with their telecommunication network assets to provide necessary communications for the Federal Government under all conditions ranging from a normal situation to national emergencies and international crises, including nuclear attack. Member agencies include the: Departments of State, Defense, Interior, Commerce, and Energy; the Federal Aviation Administration; the General Services Administration; the Central Intelligence Agency; the National Aeronautics and Space Administration; the Federal Emergency Management Agency; and the United States Information Agency. The telecommunication facilities of these Federal agencies comprise the bulk of the long distance telecommunication resources of the Federal Government. The facilities are planned, funded and operated by the parent agencies to satisfy their respective mission requirements. They are, however, through joint planning, standardization, and other coordinated management activities of the NCS organization, available to satisfy national requirements transcending those of the individual agencies. The remainder of this TIB is devoted to an examination of the relevance of national and international standards development efforts to effective performance of the NCS standards development function.

SECTION III

THE FEDERAL TELECOMMUNICATION STANDARDS PROGRAM

PROGRAM ORIGIN. The Federal Telecommunication Standards Program (FTSP) was established on October 18, 1972, in response to an August 14, 1972 letter from the Administrator, General Services Administration, delegating Federal telecommunication standards development responsibilities to the Executive Agent, National Communications System. These responsibilities were assigned to the NCS at the specific request of the Office of Telecommunications Policy (OTP). Several factors influenced the decision to establish the FTSP:

a. The development and use of common interface standards was recognized as essential to achieving interoperability among the evolving generation of Federal Government telecommunication networks;

b. Interoperability is required to maximize the utility of these networks as a national resource during times of national emergency;

c. Economic benefits are derived from eliminating unnecessary differences in international, national, and Federal standards;

d. There is a need for a telecommunication standards program at the Federal level to complement the ADP standards program of the Department of Commerce, particularly in the data communications area where the ADP and telecommunication (data transport) functions meet.

The authoritative basis for continuing the FTSP was more recently confirmed and amplified by Executive Order 12046 and by PD/NSC-53. Specifically, PD/NSC-53 states that as a matter of national security telecommuncations policy;

"functionally similar Government telecommunications networks shall be capable of interchange of traffic in emergencies," and

"to the maximum extent feasible, interstate common carrier networks, including specialized common carriers and domestic satellite carriers, should be interconnected and capable of interoperation in emergencies at breakout points outside of likely target areas."

In this way, important federal telecommunication resources simulate a coherent single system and can satisfy the most critical needs in emergency situations and the day-to-day telecommunication needs of the federal government.

PROGRAM OBJECTIVES. The objectives of the Federal Telecommunication Standards Program are:

a. To identify and remove, through standardization, as many of the technical impediments to interoperability of functionally similar Federal Government telecommunications networks as are economically feasible without significantly compromising the performance or operational integrity of these networks.

b. To identify and develop, in concert with the National Bureau of Standards (NBS), those standards that are common to both automatic data processing functions and telecommunication functions, so as to achieve a compatible and efficient interface between these two functions in the context of a total information system.

c. To eliminate unnecessary differences between Federal standards and corresponding international, national, and U.S. industry standards in telecommunications and directly related fields.

d. To improve the cohesiveness and effectiveness of the Federal telecommunication community's participation in the standards development activities of the various national and international standardization bodies.

PROGRAM ORGANIZATION AND MANAGEMENT. The Federal Telecommunication Standards Program is a functional area subdivision of the Federal Standardization Program administered by the General Services Administration (GSA) pursuant to the Federal Property and Administrative Services Act of 1949. The standards emerging from the program are published by GSA as Federal Standards and are mandatory for use, where applicable, by all Federal departments and agencies in the acquisition of telecommunications equipment, systems and services. These standards are cited as requirements in appropriate Federal Property Management Regulations and Federal Procurement Regulations (e.g., FPMRs 101-36.1308, 101-36.1309, 101-37.00 and FPR 1-4.1108).

The Manager, National Communications System (NCS) is responsible for the management and execution of the program. The detailed "modus operandi" is contained in NCS Circular 175-1 of June 6, 1973. The Manager NCS, in planning and executing the program, relies heavily on the advice and resources of an interagency committee called the Federal Telecommunication Standards Committee. This committee is chaired by the Assistant Manager, NCS for Technology and Standards and consists of technically-oriented telecommunication management personnel from the: Departments of State, Defense, Commerce, Energy, Treasury, and Health and Human Services; the Administrations of Federal Aviation, General Services, and National Aeronautics and Space; the agencies of Central Intelligence and National Security; the Federal Communications Commission; and the Library of Congress.

EMPHASIS OF FY 83-87 WORK PROGRAM. The current NCS five-year standards development effort is contained in their FY83-87 Work Program. The underlying objective of that program is to establish interoperability between systems. To meet the objective, the program focuses on the following categories and sub-categories of design features:

a. Alphabets
b. Electrical circuit interfaces
c. Language determinant features
    1. Codes
    2. Modulation techniques
d. Protocols and procedures
    1. Signaling
    2. Supervision
    3. Information packaging
    4. Error control
e. Information transfer rates
f. Compatible functional architectures.

In the past, the FTSP emphasized the first five categories with the system architecture area receiving very little attention. Prior to the ISO approving a United Kingdom proposal for the development of a standard architecture model for distributed or open systems in March 1977, there was little hope of obtaining international or national agreement on a functional architecture model. Since the ISO approval, rapid progress has been made by ISO/TC 97/SC 16 in developing the seven layer architecture reference model. A draft standard DIS 7498 has been issued for international comment and balloting. The formal adoption of DIS 7498 made developing the various layers of the reference model possible. Figure 1 is a diagram of the OSI Reference Model depicting the seven layers and the areas of interest to the NCS and NBS.

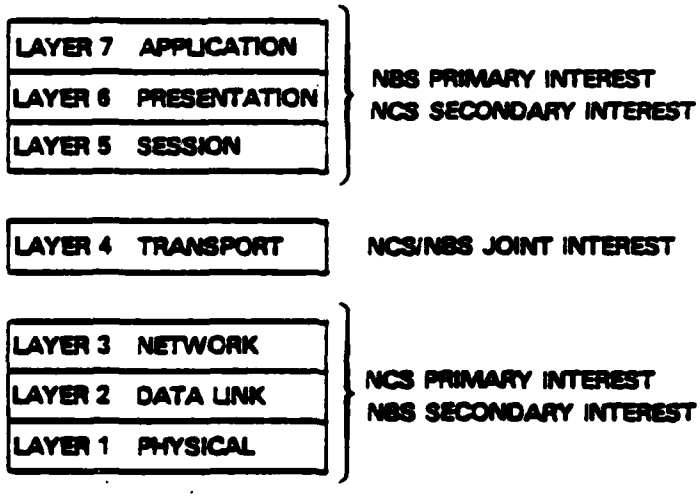


Figure 1. NCS/NBS Areas of interest in the ISO Open Systems Interconnection (OSI) Reference Model for Distributed Information Systems

This model draws a technical distinction between the functions of transporting and processing data. The full implications of viewing a telecommunication system as a total electronic information transportation system rather than a vaguely defined network of switched or point to point electronic freeways are gradually coming to light internationally. Whether or not this same view towards "total transport service" takes root in the U.S., the seven level architecture reference model will have a significant effect on the segregation of functions in distributed information systems. Accordingly, the NCS staff and the FTSC will be placing a significant amount of their human and material resources into expediting the development of Federal standards in the system architecture area. This will be accomplished through increased and better focused participation in the work of the relevant ISO, CCITT, and ANSI technical committees.

SECTION IV

INTERNATIONAL/NATIONAL STANDARDS DEVELOPMENT ORGANIZATIONS

There are five major organizations developing international, national and industrial standards in the telecommunication field:

The International Telecommunication Union (ITU)

The International Organization for Standardization (ISO)

The American National Standards Institute (ANSI)

The Electronic Industries Association (EIA)

The Institute of Electrical and Electronics Engineers (IEEE).

These organizations are the sources of standards relevant to achieving the interoperability objectives of the NCS and the Federal Telecommunication Standards Program.

ITU. The International Telecommunication Union, headquartered in Geneva, Switzerland, is a treaty organization of the United Nations. There are approximately 160 member countries; the U.S. membership is represented by the Department of State as shown in Figure 2. The origin of the ITU predates the United Nations since it is an outgrowth of the International Telegraph Union established in 1865 by a group of 20 European nations to establish common rules for international operation of telegraph systems. The purposes of the ITU as defined in the Montreux Convention of 1965 are:

a. To maintain and extend international cooperation for the improvement and national use of telecommunication of all kinds;

b. To promote the development of technical facilities and their efficient operation with a view toward improving the efficiency of telecommunication services, increasing their usefulness, and making them generally available to the public;

c. To harmonize the actions of nations.

The development of common standards that permit efficient interworking of the national telecommunications networks of various countries is essential to achieving the above purposes. The two major groups developing these standards within ITU are the International Telegraph and Telephone Consultative Committee (CCITT) and the International Radio Consultative Committee (CCIR). ITU standards are promulgated as either CCITT or CCIR Recommendations. Although the CCITT and CCIR Recommendations are not binding on the member countries and their industrial organizations, the recommendations do exert a powerful influence on the engineering, operating, and maintenance practices of most telecommunication

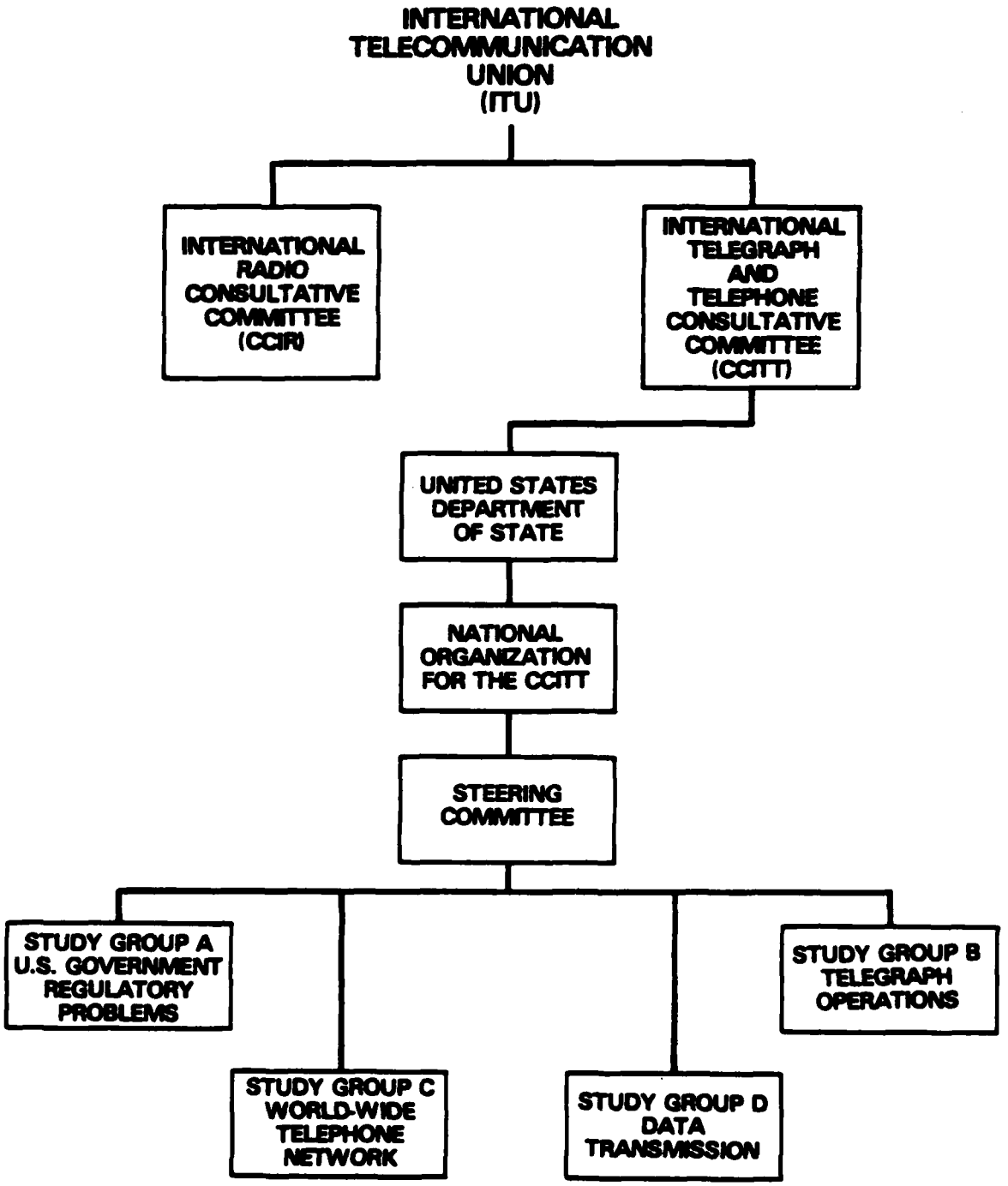


Figure 2. U.S. Organization for participation in the CCITT Division of the ITU

administrations. Certainly those industrial organizations operating in the international marketplace can ignore CCITT and CCIR Recommendations only at their peril. Relevant interoperability standards are central to achieving the goals of both the ITU and the NCS's FTSP. CCITT is a focal point of NCS due to CCITT intense standardization activities in the field of data communications. During the 1980's NCS focus on CCITT will be directed at the following study groups and activities:

a. SG VII Public Data Network Standards (e.g., X.25, X.75, etc.)
b. SG VIII Telematics (e.g., Videotex Teletex, Facsimile, etc.)
c. SG XVII Data Communications over the Telephone Network
d. SG XVIII Integrated Services Digital Network (ISDN).

ISO. The International Organization for Standardization is a voluntary international organization of 86 member countries. It was founded in 1947 to continue the work started by the International Federation of National Standardization Associations (ISA), which was chartered in 1926. The old ISA was formed to facilitate cooperative work between the national standards institutes of the various countries and to help them develop national acceptance of international voluntary standards. The purpose of the ISO is more elegantly stated; "to promote the development of standards in the world with a view to facilitating the international exchange of goods and services and developing mutual cooperation in intellectual, scientific, technological, and economic activity." ISO is recognized by the United Nations as a developer of international voluntary standards. Membership in the ISO is made up of national standard institutes of the member nations. In most cases these institutes are government organizations, with the American National Standards Institute of the U.S. being the most notable exception.

ISO is not subordinate to any other international organization, although the International Electrotechnical Commission (IEC) is affiliated with ISO. The IEC develops electrical standards such as wire, cable and waveguide standards. In collaboration with CCITT, ISO develops definitions for telecommunications, graphical symbols for diagrams, rules for the preparation of diagrams, and charts and tables for item designation in telecommunications.

ISO publishes international voluntary standards that are generally accepted by the member bodies comprising ISO. Many ISO standards have national counterparts (e.g., ISO High Level Data Link Control Procedures (HDLC)/ANSI 3.66 Advanced Data Communication Control Procedures (ADCCP)).

The NCS interest in ISO is focused on the work of Technical Committee 97 (Computers and Information Processing). Three subcommittees under TC-97, SC-6, SC-16 and SC-20 covering data communication, open system interconnection (distributed system architecture) and data encryption respectively, are of primary interest to the FTSP. The specific standards development activities of these subcommittees of particular concern to NCS and FTSP objectives are discussed in section VI.

ANSI. The American National Standards Institute is the direct lineal descendant of the American Engineering Standards Committee founded in 1918. It has gone through several name changes, including the American Standards Association (ASA) (1928), the United States of American Standards Institute (USASI) (1966), and most recently, the American National Standards Institute (ANSI). The purposes of ANSI are:

a. To provide a voluntary procedural mechanism for management and coordination of American National Standards;

b. To provide criteria for approval of proposed standards as American National (consensus) Standards;

c. To provide a clearinghouse for international and national standards and standards information;

d. To provide for representation of U.S. voluntary standards interests in international nontreaty standards organizations;

e. To provide a focal point for government/nongovernment interface where this is desired by government and the voluntary standards system.

ANSI has grown from five professional societies and three agencies of Government (Commerce, War, and Navy) in 1918 to a federation of some 200 professional, trade, technical, labor, consumer, and governmental organizations and approximately 800 individual firms. As stated in the previous discussion of ISO, ANSI also functions as the U.S. member body of the ISO.

ANSI publishes national voluntary consensus standards that are widely accepted. Many of the U.S. standards are versions of international standards (e.g., the American Standard Code for Information Interchange (ASCII) is the U.S. version of ISO Standard 646/CCITT Recommendation V.3). ANSI Standards may also be developed by professional organizations, such as the American Society for Testing Materials (ASTM) and the Institute of Electrical and Electronic Engineers (IEEE); industrial organizations, such as EIA; and committees sponsored by associations, such as Computer and Business Equipment Manufacturers Association Committee for Computers and Information Processing.

NCS participation in the standards development activities of ANSI are focused on the ANSI committee X3 for Computers and Information Processing and several of its subordinate technical committees. During the current study period (1981-84) the principal focus of the NCS will be on the work of the following technical committees:

a. X3S3 (Data Communication)
b. X3T5 (Open Systems Interconnection)
c. X3T1 (Data Encryption)
d. X3T9 (Local High Speed Network Interfaces)

The specific ANSI standards development activities for the 1981-84 time frame relevant to the interoperability objectives of the NCS and FTSP are discussed in detail in section VII.

EIA. The Electronic Industries Association was founded in 1924 as the Radio Manufacturers Association. The membership ranges from producers of the smallest electronic part to large corporations which design and manufacturer the most complex electronics devices and systems. Besides being a "trade" association, EIA's work in the development of technical standards has become widely recognized throughout the world. The Engineering Department of EIA has produced over 400 standards and publications through the efforts of more than 4,000 industry and Government representatives that participate in 225 committees and subcommittees.

EIA also develops voluntary technical standards for the electronics industry. These standards cover electronics components, communications equipment and communication systems. Many of their standards have become American National Standards by adoption through the ANSI approval procedures and have formed the basis for U.S. positions in the CCITT, ISO and IEC. Several EIA standards have been accepted as Federal Standards (e.g., RS-422-A is FED-STD 1020A). The specific EIA standards development activities for the 1981-84 time frame relevant to the interoperability objectives of the NCS and FTSP are discussed in detail in section VIII.

IEEE. The Institute of Electrical and Electronics Engineers is the world's largest professional engineering society founded in 1884. Its purpose is scientific and educational, directed toward the advancement of the theory and practice of electrical engineering, electronics, radio and allied branches of engineering and sciences. Meetings are held for discussion of professional papers, publications and literature pertaining to the electronic or electrical field. There are over 200,000 engineers and students participating in IEEE activities, directly supporting the engineering profession.

IEEE develops voluntary technical standards for the electronics industry. These standards cover electronic and electrical components, communications bus connectors, and Local Area Network standards. The specific IEEE standards development activities relevant to the interoperability objectives of the NCS and FTSP are discussed in detail in section IX.

SECTION V

RELEVANT CCITT ACTIVITIES 1981-84

The standardization objectives of the NCS's Federal Telecommunication Standards Program (FTSP) are aligned with those of the International Telephone and Telegraph Consultative Committee (CCITT). The NCS has a vital interest in the nature, scope, and specific technical content of the subject areas which will be addressed by CCITT "study questions" and resulting "recommendations" during the 1981-84 study period. Appendix 1 lists the title and subject area of the CCITT Study groups. CCITT study groups of particular interest to NCS are shown in Figure 3. Within the five study groups listed, the NCS interest is concentrated in the areas of network services and inter-network connectivity.

Each of these areas address design features of telecommunication systems which have a direct bearing on the ability of functionally similar systems to interoperate with each other and are therefore relevant to the principal objective of the FTSP. It is therefore appropriate to examine in greater detail the specific CCITT study initiatives discussed in the remainder of this section.

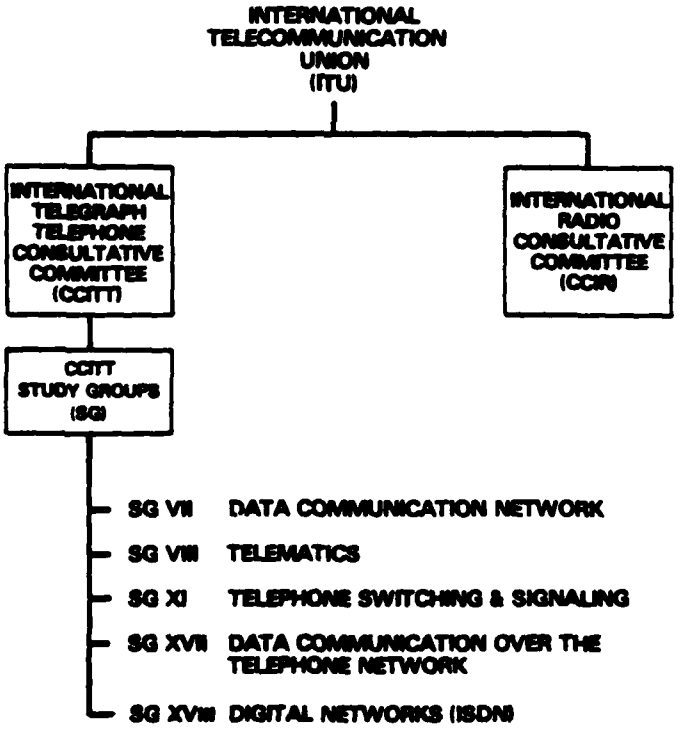


Figure 3. CCITT Study Groups of interest to the NCS

System Architecture. The CCITT activities in developing the architectural reference model are currently focused on Study Group VII (Public Data Network). However, the impact of the Open System Interconnection Reference Model on the design of the Integrated Services Digital Network (ISDN) (being developed by Study Group XVIII) are of profound significance. Considering the high priority assigned by CCITT to the ISDN development and the "service integration" nature of the ISDN concept itself, Study Group XVIII has assumed a dominant role in the architectural area during the current study period.

CCITT's principal interest is focused on levels 1 through 4 of the ISO architecture reference model (which together constitute the "Network Service"). However, they also have a vital interest in the remaining three levels even through levels 5 through 7 are generally associated with the "data processing", as opposed to the "data transport", function. This interest is derived from three principal concerns: (1) the increasing degree of interdependence of the data processing and data transport functions within the context of a total "information" system; (2) the apparent desire to maintain a reasonably clean line of functional demarcation between these functions (so that the "transport service" can be progressively optimized on a modular basis as a constant-entropy data transport system while imposing a minimum of constraints on the user); and (3) the recognition that certain data processing functions at levels 5, 6 and 7 (e.g. packet assembly/disassembly and network management are incidental, but nevertheless essential to the design of an efficient data transport service.

Achieving the NCS objective of gradually dismantling the technical barriers to interoperation of Government telecommunication systems will be greatly facilitated by a succesful effort in CCITT to agree on a standard reference architectural model and the perfection of an ISDN design compatible with this model. Of course it does not necessarily follow that all U.S. telecommunication carriers will embrace a CCITT recommendation describing a telecommunication system integrating all data and telephone services into a common digital network. However, the economic penalties of perpetuating requirements for the interfacing of fragmented data and telephone networks in the U.S. with a world-wide ISDN may well prove to be a powerful persuader. There appears to be little doubt that a large widely distributed ISDN in the Continental United States would do more to enhance the interoperability, survivability, and emergency utility of the nation's telecommunication resources than all the standards the NCS or FCC might develop.

Integrated Services Digital Network. The ISDN represents a concept rather than any specific standard or group of standards. The ISDN is an evolutionary concept representing the natural outgrowth of advancing technology and standards that are now directed toward packet switched data networks and the Integrated Digital Network (IDN). The IDN is the name applied to the telephone network that will probably exist within the next 20 years. It is envisioned to be a circuit switched network that utilizes digitally encoded voice and data transmitted on digital transmission links.

A concept as pervasive as the ISDN must be implemented carefully to effect optimum cost benefits to the user and to allow competition while retaining interoperability among different network and transmission facilities. For the user, maximum flexibility will be afforded by adherence to the principals of the Open System Interconnection Reference Model, so that all terminals will be operable on all networks. To promote interoperation between transmission facilities and networks furnished by different common carriers, it is essential also that the distinction between the layers of the reference model architecture be carefully preserved.

The benefits of the ISDN to the NCS and FTSP in terms of National Security is great. Survivability of any system is related to its redundancy, which in communications networks can be obtained by flexible routing through multiple switches. A mechanism to operationally combine all netwoks, both data and telephone, will result in a larger network which will be far more survivable than any one of its parts. The National Communications System (NCS) is supporting, through participation in the standardization areas of architecture, public data networks, and telephone networks, the development of ISDN. Because of the advancements in technology in this area, it is expected that integration of the data networks and the telephone networks will provide the most practical and economic service at some time within the near future.

User-to-User Information Transport Services and Protocols. Within the framework of the ISO reference model for open systems architecture the transport service includes the physical, link, network, and transport layers. The physical layer establishes a physical connection between nodes, the link layer corrects transmission errors, the network layer supplies protocols such as routing, and the transport layer provides end-to-end services.

An important concept is that layers above the transport layer, Layer 4, have no concern with the actual communication medium. In other words, to allow optimum transportation of information, the ISDN should determine dynamically the best means, such as circuit switched, message switched, or packet switched. In order for this to be possible, the interface between the transport services and higher layers must be truly transparent.

The International Telegraph and Telephone Consultative Committee (CCITT) has, during their last study period (1977-1980), developed several recommendations that defined protocols for three of the layers in the transport service. Recommendations X.21 and X.21 bis are basically physical layer standards that deal with the interface between terminal equipment and data circuit-terminating equipment for synchronous operation. Recommendations X.25 and X.75 deal with the link and network, protocols for use on public data networks.

Inter-Network Interfaces and Protocols. The principal focus of CCITT Recommendations (standards) is on standards that ensure the interworking compatibility of different national networks as they relate to

characteristics, which appear or are implicit, at network interconnection points. The significant progress being made by CCITT in the development of the ISDN and its related CCITT Signaling System #7 substantiates inter-network standards and protocols as the prime goals of CCITT for their 1981-84 work program.

The principal CCITT standardization initiatives in the field of inter-network protocols during the 1981-84 study period are as follows:

a. Refinement and field tests of CCITT Signaling System #7

b. Refinement of CCITT Recommendation X.75

Signaling System #7 is the common channel interoffice signaling system intended to provide all signaling between switching centers on a common high speed data channel rather than each inter-switch trunk between switching centers having its own dedicated in-band low speed signaling. The development of Signaling System #7 is important if the ISDN is to convince users of separate data communications networks that the ISDN can provide equivalent service while accommodating an integrated voice-data-graphics terminal complex.

Signaling System #7, whose basic design was completed during the 1977-1980 study period, will be further refined and field tests initiated during the 1981-84 study period. If the experience with the #6 signaling system is a valid precedent, it is doubtful that these field tests will be completed before the end of the study period. However, given the rapid moves being made in the developed countries of the Western World toward digitization of the transmission and switching plants supporting their telephone and data communication systems, it is expected that these field tests will be given high priority.

The introduction of an ISDN using Signaling System #7 in the U.S. may be delayed well beyond the time when other counties are implementing theirs. In the meantime, systems such as DoD's TRI-TAC and possibly other are counting on a prevalence of digital switching and transmission facilities for which the signaling system #7 system is ideally suited. The NCS will be looking to DoD and other agencies for input on ways that the #7 signaling system might be refined.

The X.75, Terminal and Transit Call Control Procedures and Data Transfer System on international circuits between packet-switched data networks, specifies the gateway interface for inter-working between public packet-switched networks. This is architecturally and procedurally similar to CCITT Recommendation X.25 for interfacing terminals with public packet-switched networks.

The telecommunication administrations designed X.75 for connection of public data networks only, and not for connection of dedicated or private networks to public data networks; X.25 is envisioned for those later applications. There is still controversy in this regard and further

study is needed to determine the appropriateness of expanding the scope of X.75. The X.75 could potentially provide the key to interoperability for NCS packet networks.

Modems. The CCITT during the 1977-1980 study period was quite active in the development of CCITT Recommendations for certain types of data terminal equipment, and was quite prolific in the development of recommendations to standardize the modulation technique and other interoperability-determinant design features of modems. These efforts will continue and accelerate in the 1981-1984 study period with emphasis on 2400 bits/s 2-wire, 16kbits/s 4-wire modems, and digital facsimile terminal equipment.

The CCITT efforts with respect to modem standardization in the study period 1981-84 will be focused on:

a. The 2400 Bit/s 2-wire Duplex Modem
   This standard has considerable interest within CCITT. The major obstacle in adoption of this standard at an early date is the proposal of two different modulation techniques being proposed, neither of which is clearly better than the other. A standard in this area is very important to NCS interoperability.

b. The 16000 Bit/s 4-wire Duplex Modem
   This project has limited support within CCITT. In particular, it is not strongly supported by the United States. Except for Department of Defense applications in the field of digital voice, little interest has been expressed in this project by NCS operating agencies.

c. Remote Loopback Testing Standards
   This family of standards is given a relatively high priority within CCITT. Loopback testing is probably more important in day-to-day operations than it is in emergency restoral and reconstitution of the NCS.

Telematics. Telematics is a new area that defines Videotex, Teletext, and Facsimile equipment and services. CCITT Study Group XIV has issued Recommendation T.2, T.3, T.30, and draft Recommendation R.4. These recommendations cover Group 1, 2, and 3 facsimile apparatus, and the development of control procedures which will enable a Group 3 machine to interoperate with Group 1 and 2 equipment. All three groups of equipment are analog devices. However, Group 3 equipment represents a bridge from analog to digital machines in that they incorporate data compression techniques and binary coded control procedures. Approval by the CCITT Plenary Assembly of the above Recommendations will conclude all major standardization efforts by the CCITT relating to analog facsimile machines.

The 1981-1984 CCITT study period will focus on the development of recommedation pertaining to Group 4 machines, protocols, and definitions of additional categories of facsimile machines. These areas will be very important to the NCS. The Group 4 machine will be a digital device designed primarily for use over Public Data Networks (PDN). However, access to many PDNs will be through the Public Switched Telephone Network (PSTN) due in large part to the lack of PDN's in many countries. It is, therefore, imperative to develop common machine standards and protocols to ensure compatibility and interoperability among machines of different manufacturers. In addition, other services such as Videotex and Teletex, as well as ISDN, need to be considered in the development and implementation of new facsimile protocols.

SECTION VI

RELEVANT ISO ACTIVITIES 1981 - 84

The International Organization for Standardization, more commonly referred to in the U.S. as the International Standards Organization (ISO), is currently in the process of standardizing the Reference Model of Open Systems Interconnection to provide a common basis for the coordination of standards developments for the purpose of systems interconnection, while allowing existing and evloving standards to be placed in perspective with the overall architectural Reference Model. Figure 4 provides a graphic view of the Reference model.

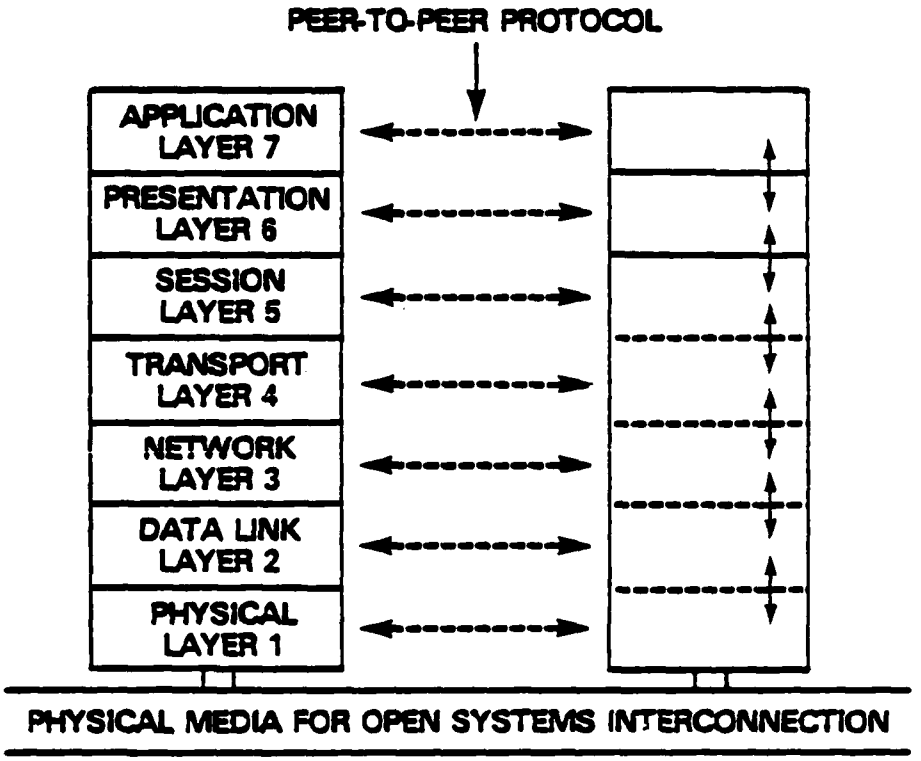


Figure 4. ISO Open System Interconnection Seven Layer Reference Model

The term "Open Systems Interconnection" (OSI) qualifies standards for the exchange of information among systems that are "open to one another for this purpose by virtue of their mutual use of these applicable standards.

"Openness" does not imply any particular systems implementation, technology or interconnection means, but rather refers to the mutual recognition and support of the applicable standards.

It is also the purpose of the Reference Model to identify areas for developing or improving standards, and to provide a common reference for maintaining consistency of all related standards. It is not the intent of the Reference Model to serve as an implementation specification, nor as a basis for appraising the conformance of actual implementations, nor to provide a sufficient level of detail to define precisely the services and protocols of the interconnection architecture. Rather, the Model provides a conceptual and functional frame work which allows international teams of experts to work productively and independently on developing standards.

NCS and FTSP efforts are concentrated in two (2) major Study Committees (SC): SC-6 dealing with Data Communications and SC-16 dealing with Open Systems Interconnection. Figure 5 defines the organization of these study committees and their respective work groups. Efforts under way in both committees are crucial to the NCS goal of interoperability.

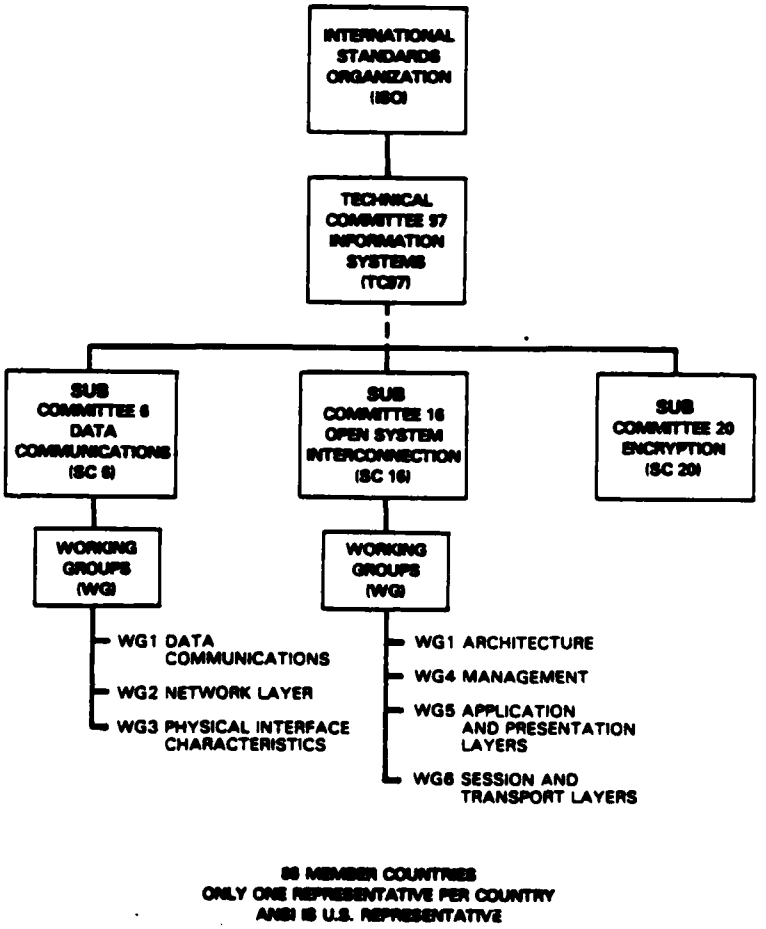


Figure 5. ISO Study Committees of Interest

The standardization activities of each of the Working Groups is be described in the following paragraphs.

Working Group 1 Data Link Layer (ISO TC97/SC6/WG1)

a. **OSI Data Link Service Definition**. This effort defines the services and functions at the boundary between the Data Link and the Network Layer.

b. **Enchancement of the OSI Data Link Protocol**. This effort defines enchnacements to the Data Link protocol. Areas to be studied to determine additional enhancements include local area network link level protocol requirements.

Working Group 2 OSI Network Service (ISO TC97/SC6/WG2)

a. **OSI Network Service Definition**. This effort defines the services and functions at the boundaries between the Physical, Data Link, and Network layers of the OSI Reference Model. The OSI Network Definition will define the classes of service, quality of service and the functional Specifications of each service.

b. **OSI Internal Organization of the Network Layers**. This development effort is intended to define the architecturally sub-layering in the Network Layer of the OSI Reference Model.

c. **OSI Network Addressing Standard**. This Standard development effort will define addressing and routing Standards for OSI. This development should provide standardized addressing and routing shema for a single or multiple systems within the criteria of the OSI Reference model.

d. **OSI Inter-Network Protocol Requirements Definition**. The InterNetwork Protocol Requirements Definition is the effort of defining how similar or dissimilar networks could communicate among each other with a common interface or Gateway that has similar features and functions.

e. **Gateway Definition**. This effort is to define requirements for a Gateway between private and public networks. Future work in this area will lead to service definitions, protocol definitions and interface definitions.

f. **Customer Access for Integrated Services Digital Network (ISDN)**. This project through interaction with CCITT and ISO will develop requirements for ISDN interfaces and protocols.

Working Group 3 Physical Interface Characteristics. (ISO TC97/SC6/WG3). This working group develops in concert with the appropriate EIA TR30 subcommittee Physical interface definitions and requirements. Efforts underway include development of the mini interface physical connector.

Working Group 1 Architecture (ISO TC97/SC16/WG1)

a. OSI DIS 7498. OSI DIS 7498 is the draft international standard (DIS) for the OSI Seven Layer Reference Model. It was approved in Tokyo, Japan in June of 82, to move this document from a draft proposal (DP) status to a DIS status. The DIS was approved as an International Standard (IS) by early 1983. With adoption of the International Standard for the Reference Model, the framework will be established for Layer Services and Protocol development for the next four to five years.

b. Security for the Reference Model. The present project under study within Working Group 1 is to define potential threats to the Reference Model and Define countermeasures to these threats.

c. LANs Architecture in respect to OSI Reference Mocel. The application of OSI principles, primarily in the Transport Services, to Local Area Network (LAN) Standards.

d. Coordination with CCITT. ISO and CCITT have agreed to coordinate with one another in the development of the Reference Model. There major area of coordination is being done on layers 3 and 4 of the OSI Reference Model.

e. OSI Architecture Development. Continuing effort is planned for 1981-1984 for refinement of the present architecture and the definition of new services and protocols to enhance the architecture.

Working Group 4 Management (ISO T97/SC16/WG4)

This Working Group was formed during 1982 to study and define the management requirements for system and layer management for the OSI Reference Model. The major efforts underway within this Working Group are described below.

a. System Management Definition. This working group was formed to define the system management (both local and remote) between OSI open systems.

b. Layer Management Definition. This development effort is aimed at defining management between layer entities in a local open system. Service definitions for Layer Management are expected to be produced in the 1984-85 timeframe.

Working Group 5 Presentation and Application (ISO TC97/SC16/WG5)

a. Presentation and Application Service Definitions. This effort is to define the service specifications for the Presentation and the Applications Layers. It is expected that this effort will be produce service specifications in the 1983-84 timeframe and a DP will be ready for ballot by 1985.

b. Universal Application Sub-Layer. This working group is developing a document defining the functionality of the Universal Application Sub-Layer of the OSI reference model. Interface specifications for the Sub-Layer are expected to be defined by 1985.

c. Virtual Terminal. This effort is to provide a conical definition of a terminal. This model will be developed into a service definition and a protocol specification.

d. Job Transfer and Manipulation. This effort is being focused on developing protocols and service specifications to support remote job entry (RJE) functions of job transfer and manipulation between open systems.

Working Group 6 Transport and Session Layer (TC97/SC16/WG6)

a. DP 8073 Transport Protocol Specification. The Transport Protocol Specification DP 8073 was approved June 1982 in Tokyo. DP8073 is expected to become a DIS in 1983. This document defines the protocol requirements for Layer 4 of the OSI Reference Model.

b. DP 8072 Transport Service Definition. The Transport Service Definition DP 8072 was approved June 82 in Tokyo. The service definition defines the functions to be performed by the layer and the requirements of interfacing to layers above and below.

c. Session Protocol. Session Protocol Specification is presently being defined. This protocol specification is expected to become a Draft Proposal (DP) in 1983.

d. Session Service. Session Service Definition defines the services to be performed in the session layer. The Session Service Definition is expected to become a DP in 1983.

SECTION VII

RELEVANT ANSI ACTIVITIES 1981 - 84

The Standardization activities of the American National Standards Institute (ANSI) on Computers and Information Processing, X3, relevant to the NCS and the FTSP are centered in four Technical Committees (TC's), and their subordinate Task Groups (TG's). These Technical Committees are:

X3S3 - Data Communication

X3T1 - Data Encryption

X3T5 - Open Systems Interconnection

X3T9 - Local High Speed Network Interfaces

Figure 6 depicts the X3 organization of interest to the NCS.

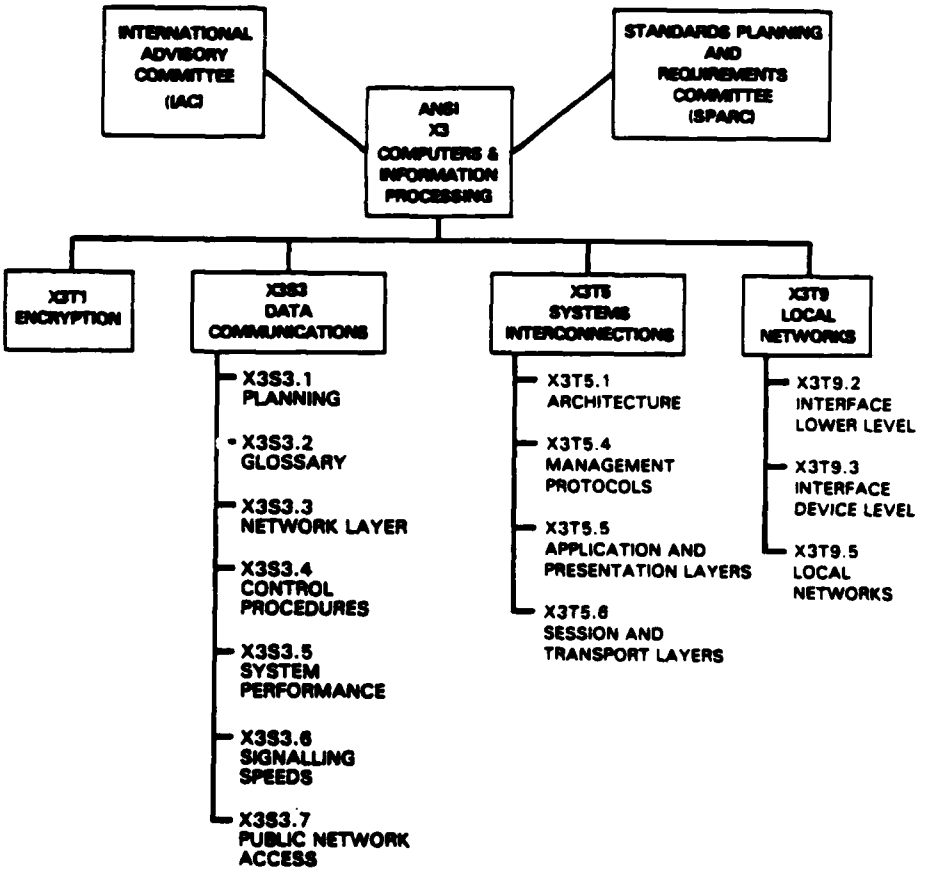


Figure 6. ANSI X3 Technical Committees and Task Groups of Interest

NCS interest in these ANSI Technical Committees parallels the interest in relevant international CCITT and ISO committees, described previously, and in addition covers a broader spectrum of effort (e.g., implementation of the data encryption standard (FIPS 46), digital systems performance, etc.). In the 1981 - 84 time frame, the development of the open systems interconnect reference model is the prime goals of the X3 Technical Committee.

X3S3 - Data Communication

X3S3.3, X3S3.4 and X3S3.7 are the Task Groups working in coordination with TC97/SC6 in the development of the OSI Reference model and development in ISDN recommendations.

Major standards development efforts planned for the 1981-1984 study period are:

a. **OSI Network Service Definition**. This effort defines the services and functions at the boundaries between the Physical, Data Link, and Network layers of the OSI Reference Model. The OSI Network Definition will define the class of service, quality of service and functional specifications of each service.

b. **OSI Internal Organization of Network Layers**. This development effort is intended to define the architecturally sub-layering in the Network Layer of the OSI Reference Model.

c. **OSI Network Addressing Standard**. This standard development effort will define addressing and routing standards for OSI. This development should provide standardized addressing and routing schema for a single systems or multiple system within the context of the OSI reference model.

d. **OSI Inter-Network Protocol Requirements Definition**. The InterNetwork Protocol Requirements Definition is the effort defining how similar or dissimilar network could communicate among each other with a common interface or Gateway that has similiar features and functions.

e. **Gateway Definition**. This effort is to define requirements for a Gateway between private and public networks. Future work in this area will lead to service definitions, protocol definitions and interface definition.

f. **Customer Access for Integrated Services Digital Network (ISDN)**. This project through interaction with CCITT and ISO will develop requirements for ISDN interfaces and protocols.

X3T1 - Data Encryption

Major development efforts planned by X3T1 for 1981-84 include;

a. Security for the Reference Model. The X3T1 Technical Committee is working closely with X3T5.1 to determine potential threats to the reference model and to determine what, if any, action could be taken to prevent or minimize the effects of threats.

b. Development of Encryption Algorithms. X3T1 working in conjunction with government and industry is responsible for the design and development of algorithms for encryption systems.

c. Key Distribution. X3T1 is developing standards and procedures for distribution of encryption keys (e.g., public key distribution systems, etc.)

X3T5 - Open Systems Interconnection

X3T5.1, X3T5.5, and X3T5.6 are the Task Groups working in coordination with TC97/SC16 in the development of the OSI Reference Model. Major standards development efforts for 1981-84 include:

a. OSI IS 7498. X3T5 groups have been a major contributor to the development of the OSI IS 7498 open system interconnection reference model and will continue this effort by defining U.S. positions on requirements for the Reference Model.

b. Security for the Reference Model. When DIS 7498 was changed from DP status the U.S. was the only country that was interested in security. While in Tokyo, Japan, the U.S. stressed great concern that the reference model should have some form a security. ANSI X3T5 was given the task of defining potential threats to the reference model and determine what steps should be taken to counter these threats and the impact on the different Layers of the model.

c. LANs Architecture in respect to OSI Reference Model. The application of OSI principles (primarily in the Transport Service) transports LAN to Local Area Network Standards.

d. Coordination with CCITT and ISO. The ANSI X3T5 subcommittee participates in the coordination of how CCITT looks at the reference model and how the U.S. looks at it and tries to determine the best possible solution to the differences of design.

e. OSI Architecture Development. Continuing effort is planned for 1981-84 for refinement of the present architecture and the definition of new services and protocols to enhance the architecture.

f. Universal Application Sub-Layer. This working group is developing a document defining the functionality of the Universal Application Sub-Layer of the OSI reference model. Interface specifications for the Sub-Layer are expected to be defined by 1985.

g. Virtual Terminal. This effort is being focused on developing protocols and service specifications to support remote job entry (RJE) functions of job transfer and manipulation between open systems.

h. Transport and Session.

DP 8073 Transport Protocol Specification. The Transport Protocol Specification DP 8073 was approved June 1982 in Tokyo and is expected to become a DIS in 1983. X3T5.6 work is continuing on the Transport.

DP 8072 Transport Service Definition. The Transport Service Definition DP 8072 was approved June 82 in Tokyo.

Session Protocol Specification. Session Protocol Specification is expected to become a DP in 1983. Work on the protocol specificaton is continuing.

Session Service Definition. Session Service Definition is expected to become a DP in 1983. Work on the session service definition is continuing.

X3T9 - Local High Speed Network Interfaces

Major efforts for 1981-84 by X3T9 include:

a. Local High Speed Network Interfaces. The ANSI X3T9 committees are in the process of developing standardized interfaces for LANs. These LANs will be capable of data transfer rates of 50 mbs or greater.

b. Local High Speed Network Protocol Specifications LANs. The ANSI X3T9 committees are in the process of developing Local High Speed Network Protocol Specifications for LANs capable of data transfer rates of 50 mbs or greater.

The NCS is either participating in, or monitoring the work of all of these Technical Committees, and Task Groups to ensure that the interoperability goals of the NCS are considered. Additionally, the NCS and the FTSP believe that compatible national and international standards for communications will provide benefits to the U.S. Government in the form of increased compatibility, flexibility and cost effectiveness.

SECTION VIII

RELEVANT EIA ACTIVITIES 1981 - 84

The Electronic Industries Association (EIA) standardization activities relevant to the NCS and the FTSP are concentrated in three technical committees and their subordinate subcommittees. The technical committees are:

a. TR-29 - Facsimile Systems and Equipments

b. TR-30 - Data Transmission Systems and Equipment

c. TR-41 - Voice Telephone Terminals

Figure 7 represents the EIA Technical Committee of interest to the NCS.

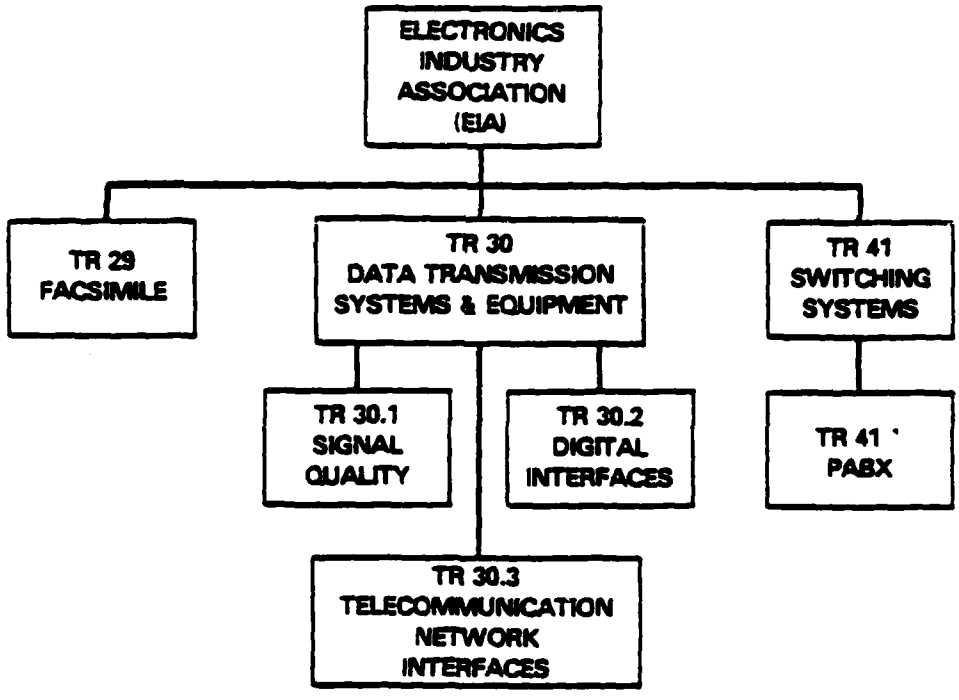


Figure 7. EIA Technical Committees of Interest

The specific standardization activities of interest are described in the following paragraphs.

EIA Technical Committee on Facsimile Systems and Equipment (EIA TR-29).

This committee is focusing its efforts on completing standards for Group 3 facsimile apparatus and control procedures for document transmission in the General Switched Telephone Network. These standards are based upon CCITT Recommendations T.4 and T.30 respectively. During the current CCITT study period, this committee will be concentrating on the development of machine specifications for Group 4, digital facsimile apparatus designed primarily for use on Public Data Networks (PDN) and Integrated Services Digital Network (ISDN). Protocols for Group 4 facsimile apparatus must be cognizant of telemetic equipment and service requirements.

It is an NCS objective to develop common machine standards and protocols to ensure compatibility and interoperability among machines of different manufactures.

EIA Technical Committee on Data Transmission Systems and Equipment (EIA TR-30).

The Subcommittee on Signal Quality, EIA TR-30.1, standardizes parameters that affect the electrical charactristics measured between a terminal and a modem. The projects of this subcommittee are important to the NCS for two reasons. First, to promote rapid restoral of communications, it is desirable that terminal equipment used throughout the Government, in local or switched configurations, be capable of operating over restored facilities. Second, the signal quality between terminal equipment and modems determine the required signal quality of the network. Specifying the generator output and receiver input signal qualities implicitly establishes the network transfer characteristics.

The following areas in which standards will be developed are important to the NCS:

a. Signal quality for synchronous interfaces. This standard is intended for use with the new integrated circuit generators and receivers. Its impact is far reaching. The standard must determine the required signal quality at new multiple-rate, frequency synthesized, modems and digital multiplexers. Both point- to-point and tandem network configurations will be considered.

b. Integrated circuit, unmodulated generators and receivers. The new generators and receivers will be compatible with Federal Standards 1020A and 1030A, and MIL-STD-188-114, but will offer enhanced features, such as the ability to connect several generators in parallel and to be used over greater distances. Rapid advances in integrated circuit (IC) technology make these improvements possible. However, caution must be exercised as the standard is developed to not preclude economic implementation of the standard due to stringent transmission system requirements.

c. Generators, receivers, and transmission facilities for local computer networks. The interconnection of local networks over long distance transmission systems imposes unique requirements on generators and receivers. Since a hundred or more may be connected in parallel, contention must be quickly detected and tolerated.

The Subcommittee on Digital Interfaces (EIA TR-30.2) developes standards dealing with the functional interface between terminals and modems. Equipment and transmission systems are impacted, since the transmission system must provide the features and quality to complement the equipment. The following areas for standardization are important to the NCS:

a. Interface with fewer leads, than current "mini-interface". Current interfaces have multiple control circuits between terminals and modems to control modem operation and provide for loop-back tests. For example, Federal Standard 1031, equivalent to EIA Recommended Standard 449, specifies a 37-pin connector. A large portion of the present inter-equipment wiring can be eliminated by using microcontrollers to encode control information on one pair of leads in each direction. The mini-interface should be compatible with both message switched and circuit switched networks and reduce wiring costs.

b. Automatic network tests. Commercial carriers are promoting the use of automatic, remote testing to isolate network faults and to offset the cost increase of technical personnel. The capability to quickly detect degraded sections of a network or verify the operability of a restored mode is of great value to the Government. Signaling remote modems to automatically perform specific tests loop back is the major area of discussion at this time..

The Subcommittee on Telecommunication Network Interfaces (TR-30.3) develops standards to define the interface between the modem (DCE) and the telecommunication network. Standards are planned for both switched and the leased-line network interface applications. Standards in this area will permit data circuit-terminating equipment with like capabilities to be interchanged and to be connected to other, functionally similar networks, if required.

EIA Technical Committee on Voice Telephone Terminals (TR-41)

There are seven subcommittees under TR-41 working on such areas as telephone instruments, PBXs, and key telephone systems. Since most Government installations lease their telephone equipment, telephone standards have less potential impact upon NCS interoperability than other standards. Telephone standards will have a lower priority than many of the standards projects previously mentioned, because of their wide scope, potentially high resource requirement, and limited impact.

SECTION IX

RELEVANT IEEE ACTIVITIES

The Institute of Electrical and Electronics Engineers (IEEE) develops many electronic interface standards for communications systems. One effort that concerns the NCS is the IEEE 802 Local Area Network in progress.

Geographic size, data rate, and ownership distinguishes the Local Area Network from other types of data networks. The Local Area Network is usually confined to a moderate size geographic area such as an office building, a warehouse or a campus. The network functions on a communications channel with moderate to high data rate and a consistently low error rate. Lastly, the network is usually owned and operated by a single organization.

The objective of the Local Area Network standards development is to ensure compatibility between equipment made by different manufacturers. To accomplish this, the standards being defined will provide specifications which establish common interfaces and protocols for local area data communications networks. The standards being developed are reviewed by representatives of ANSI to ensure compatibility with the OSI Reference Model. The three subcommittees involved in the IEEE 802 development effort are discussed in the following paragraphs.

Data Link Media Access Control (DLMAC). The charter of the DLMAC subcommittee is to develop service definitions and protocol specifications for logical link and media access control. The logical link control (LLC) protocol being developed is a multi-access peer protocol for use in a multi-station peer to peer environment. The media control protocols being developed reflect the different procedures required for media access. A joint effort with the HILI Subcommittee will define the interface specification to the Network layer (layer 3).

Higher Level Interfaces (HILI). The charter of this subcommittee calls for investigation of local area network protocol issues above the Data Link Layer (Layer 1). Major efforts currently underway include definition of protocol issues involved in the connection of LANs to each other and to wide area long haul networks. Investigation of LAN features required to support network management and definition of an interface specification between Data Link (layer 2) and Network Layer (layer 3) will be performed jointly with the DLMAC Subcommittee.

Media Interface (MI). This Subcommittee has the responsibility to investigate interfaces between the transmission media and the media attachment devices. Development effort is proceding for the interface specifications and the physical signalling protocols.

The development of the Local Area Network (LAN) standards will potentially permit greater interoperability between communication systems. Communications standards developed by IEEE have been and will continue to be in concert with the interoperability goals of the NCS and FTSP.

SECTION X

NCS STANDARDIZATION REQUIREMENTS OUTSIDE THE SCOPE OF CURRENT INTERESTS OF INTERNATIONAL AND NATIONAL STANDARDS ORGANIZATIONS

As illustrated in the preceding sections, the interests of the standardization activities of the NCS and those of the CCITT, ISO, ANSI, EIA and IEEE largely focus on interoperability of functionally similar equipment and systems. However, interoperability or compatibility is only one of many factors which must be addressed by standards to assure that essential Federal telecommunication systems can function as required by Presidential Directive/NSC-53.

One telecommunication standard category which is not likely to engender a significant amount of overt support in the various national and international standards organizations is the protection of telecommunication facilities from disabling damage by electromagnetic pulse (EMP) effects due to high-altitude nuclear detonations. These are the type of standards in which the Government must take the lead in developing, being careful of course to highlight any fringe benefits, in terms of better lightning or electrical surge protection, which the private sector may find economically attractive.

The NCS is planning to develop a family of facility oriented EMP standards that provide definitive and economical design criteria and maintenance practices. Disabling damage is defined for the attended and unattended facilities as follows:

a. DISABLING DAMAGE (ATTENDED FACILITY). Damage to equipment/components which prevent the facility from performing its primary function, and for which neither standby nor replacement equipment is available on-site. The facility is also disabled when repair or replacement of failed equipment is beyond the capability of on-site personnel.

b. DISABLING DAMAGE (UNATTENDED FACILITY). Damage to equipment/components which prevents the facility from performing its primary function, and requires the dispatch of maintenance personnel to restore operation.

After the development of these standards the NCS hopes to influence the industry that developes communications and computer equipment to adhere to these standards.

APPENDIX 1
CCITT STUDY GROUPS

DESIGNATION		TITLE
COM I	Study Group I	Definition and operational aspects of telegraph and telemetic services (facsimile, Teletex, Videotex, etc.)
COM II	Study Group II	Telephone operation and quality of service
COM III	Study Group III	General tariff principles
COM IV	Study Group IV	Transmission maintenance of international lines, circuits and chains of circuits; maintenance of automatic and semi-automatic networks
COM V	Study Group V	Protection against dangers and disturbances of electromagnetic origin
COM VI	Study Group VI	Protection and specifications of cable sheaths and poles
COM VII	Study Group VII	Data communication networks
COM VIII	Study Group VIII	Terminal equipment for telematic services (facsimile, Teletex, Videotex, etc.)
COM IX	Study Group IX	Telegraph networks and terminal equipment
COM XI	Study Group XI	Telephone switching and signaling
COM XII	Study Group XII	Telephone transmission performance and local telephone networks
COM XV	Study Group XV	Transmission systems
COM XVI	Study Group XVI	Telephone circuits
COM XVII	Study Group XVII	Data communication over the telephone network
COM XVIII	Study Group XVIII	Digital networks

APPENDIX 2
FEDERAL TELECOMMUNICATIONS STANDARDS DEVELOPMENT PROCESS

REQUIREMENTS DETERMINATION. Specific proposals for the initiation of a project to develop a Federal telecommunication standard are presented to the FTSC and NCS management in a document called a Statement of Requirement (SOR). The SOR succinctly describes the need which the proposed standard would satisfy, the relevance of satisfying these needs to the removal or avoidance of interoperability impediments to Federal telecommunication systems, and any related national and international standards development efforts which would enhance the universality of the proposed standard. SOR's can theoretically originate in any Federal department or agency. In actual practice, most are originated by agencies represented on the FTSC or by the NCS staff.

Once the SOR for a proposed standard development project is approved by FTSC and NCS management, the standards development process begins, and this process is described in the remaining section of this appendix. The establishment mission and function and operation of Subcommittees will be described in appendix 3.

STANDARDS DEVELOPMENT PROCESS. The first step is the selection of an appropriate development method and activity by the NCS management (with FTSC advice). Since a major objective of the Federal Telecommunication Standards Program is the elimination of unnecessary differences between Federal standards and related national and international standards, development of the required standard through well-focused joint undertakings with appropriate industry, national, and international standardization groups obviously ranks high in the choice of a development method. A list of the industry, national, and international standards development groups in which the NCS and FTSC member agencies are active participants is in Section V. In those exceptional instances where national and international standards development groups are unable or unwilling to undertake the timely development of a standard which could be adapted to satisfy the requirements of the SOR, the NCS and FTSC do not hesitate to develop the required standard on a unilateral basis. In the latter instances the development activity may be an FTSC technical subcommittee, or a single Federal agency.

STANDARDS COORDINATION AND APPROVAL. NCS management with the advice of the FTSC, determines when the development of a proposed Federal telecommunication standard has reached the point where it is ready for formal coordination with Federal agencies and for public comment. Prior to reaching this point the standard has typically been coordinated on an informal basis with technical personnel of FTSC member agencies and technical experts on related national and international standards development groups. The Federal agencies with which proposed Federal telecommunication standards are formally coordinated are as follows: STATE, DOD, CIA, FAA, NASA, GSA (ADTS), ENERGY, COMMERCE, INTERIOR, ICA, HHS, AGRICULTURE, LABOR, JUSTICE, TREASURY, TRANSPORTATION, EPA, VA, FCC, USPS, FDIC, TVA, FEDERAL RESERVE, AND GSA (FSS).

When the comments of Federal agencies and the general public on the proposed standard have been resolved to the satisfaction of the FTSC and NCS management, the standard is forwarded through the Executive Agent, NCS to the Office of Science and Technology Policy (OSTP) for final policy-level approval. The OSTP, after obtaining the concurrence of other interested organizations in the Executive Office of the President, i.e., the National Security Council staff, forwards the standard to the Administrator GSA for review, OMB release pursuant to E.O. 12292, and finally, publication.

If the proposed standard is to be issued as a joint Federal Telecommunication standard and Federal Information processing Standard, because of its applicability to both the data processing and data transport functions, the coordination and approval process is more complex. In this case the proposed standard is coordinated with a much wider range of Federal departments and agencies through a letter signed by both NCS and NBS management and designed to elicit a single set of comments reflecting the views of the agency from both a telecommunications and ADP perspective. Likewise, a Federal Register announcement is aimed at eliciting the same sort of balanced response from the general public and various interest groups. When the resulting comments are finally resolved to the satisfaction of the FTSC, NCS and NBS management the proposed joint standard is forwarded simultaneously to the OSTP and the Secretary of Commerce for final policy approval and subsequent publication.

Standards Publication. Federal Telecommunication Standards are published by GSA Federal Supply Service in the TELE Federal Supply Classification (FSC) category. The published standards are available for a nominal charge from any of the following sources:

(a) General Services Administration
Specification Unit (WFSIS)
7th and D Street, S.W.
Room 6039
Washington, DC 20407

(b) Single copies may be obtained from the GSA Service Centers in Boston, New York, Philadelphia, Atlanta, Chicago, Kansas City Mo, Fort Worth, Denver, San Francisco, Los Angeles, and Seattle.

(c) Naval Publication and Forms Center
5801 Tabor Ave.
Philadelphia, PA 19120

Revision of Published Standards. Federal Telecommunication Standards are automatically reviewed every five years to determine whether they should be continued in force, revised, superseded, or cancelled. In practice, most of the standards, particularly in the high technology areas of data communications, are revised at more frequent intervals. The standards are usually structured in modular form so as to facilitate updating to reflect state-of-the-art advances with due regard for backward compatibility with equipment designed to previous versions of the standard.

Relationship of Federal Telecommunication Standards to Voluntary National and International Standards. The principal developers of voluntary national and international standards relating to the telecommunication function are the International Telecommunication Union, the International Organization for Standardization, the American National Standards Institute and the U.S. Electronic Industries Association. Although each of these groups has its own repertoire of objectives and anticipated benefits from standardization, the one which has in common in varying degrees with the FTSP is interoperability of functionally similar equip- ment and systems. To the extent that the output products of these organizations are timely and satisfy or can be adapted to satisfy, the NCS interoperability objectives, they are adopted as mandatory Federal standards. The latter step is necessary to ensure that all Federal agencies are aware of and use the applicable interoperability-determinant portions of what would otherwise be a purely voluntary standard.

Relationship of Federal Telecommunication Standards to Federal Information Processing Standards. Federal standards for Automatic Data Processing equipment, systems, and services are developed by the National Bureau of Standards pursuant to responsibilities assigned by Public Law 89-306, Executive Order 11717, and Department of Commerce Organization Order 30-206 (June 12, 1972). Federal telecommunication standards are developed by the Office of Technology and Standards, National Communications System, pursuant to responsibilities assigned to the General Services Administration (GSA) by the Federal Property and Administrative Services Act 1949 (as amended) and delegated to the Manager, National Communications System by GSA letter dated August 14, 1972.

The Chairman of the FTSC is responsible for liaison with the Institute for Computer Sciences and Technology of the National Bureau of Standards in the implementation of the mutual (NCS/NBS) responsibilities for the development of Federal standards related to data transmission and teleprocessing. Figure 8 shows the complementary relationships between the FTS and FIPS Programs.

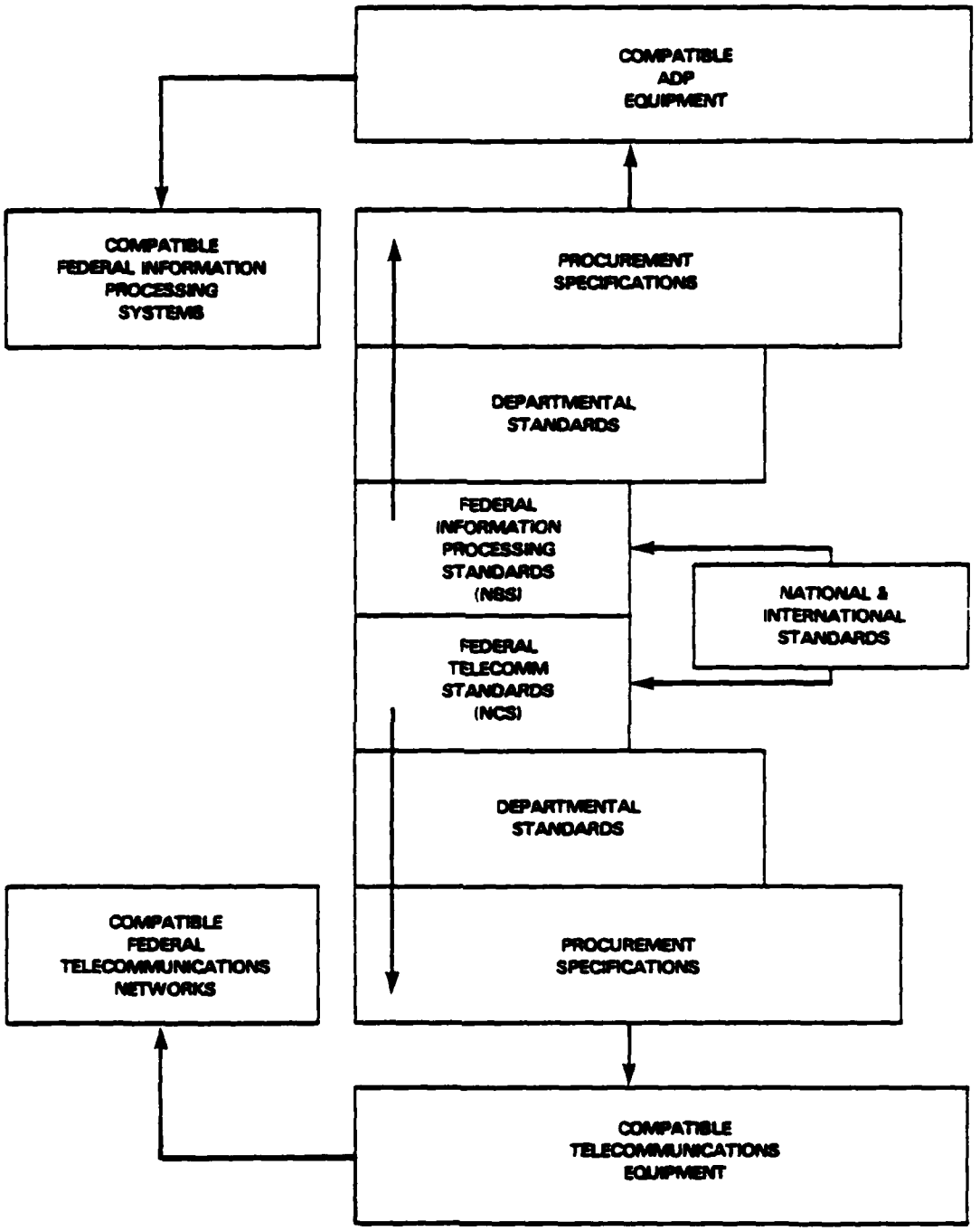


Figure 8. Complementary Relationship between the FTS and the FIPS Programs

APPENDIX 3
THE ESTABLISHMENT, MISSION AND OPERATION OF SUBCOMMITTEES IN THE FTS DEVELOPMENT PROCESS

SUBCOMMITTEES. Subcommittees may be established from time to time by the FTSC to deal with the development of telecommunication standards. These subcommittees will cover the areas of communication switching and transmission, communication terminal equipment and multiplexing equipment, formats, procedures and coding and other areas as they become apparent. Members of the FTSC arrange for participation of qualified technical representatives to the subcommittees.

Mission. The subcommittees conduct a background search for relevant national, international, industry and departmental standards, and then develop the initial statement of the scope and a broad program of work for each task assigned by the FTSC. Upon approval of this action by the FTSC, the subcommittee develops a detailed work plan, including target dates for completion of its tasks. This work plan is submitted to the FTSC for review. The FTSC will then request the GSA Standards Division to assign a Project and Project Control Number to the task. The subcommittee then proceeds with the development and informal coordination of the proposed standard. Subsequent revision to work statements, completion dates, etc., are subject to the review and approval of the FTSC. If changes are made in completion dates, these will be reported to the GSA Standards Division. Subcommittees may take one of the following methods to develop a standard:

(1) Develop the standard as a matter of subcommittee business.

(2) Assign the task of development to an ad hoc committee within the subcommittee.

(3) Assign the task of development to one of the participating agencies, with the subcommittee reviewing the work and forwarding the results with their recommendation to FTSC.

Functions. The functions of the subcommittee is to:

(1) Accomplish the tasks assigned in approved work statements.

(2) Assign the task of developing of a given standard, and monitor this deveopment.

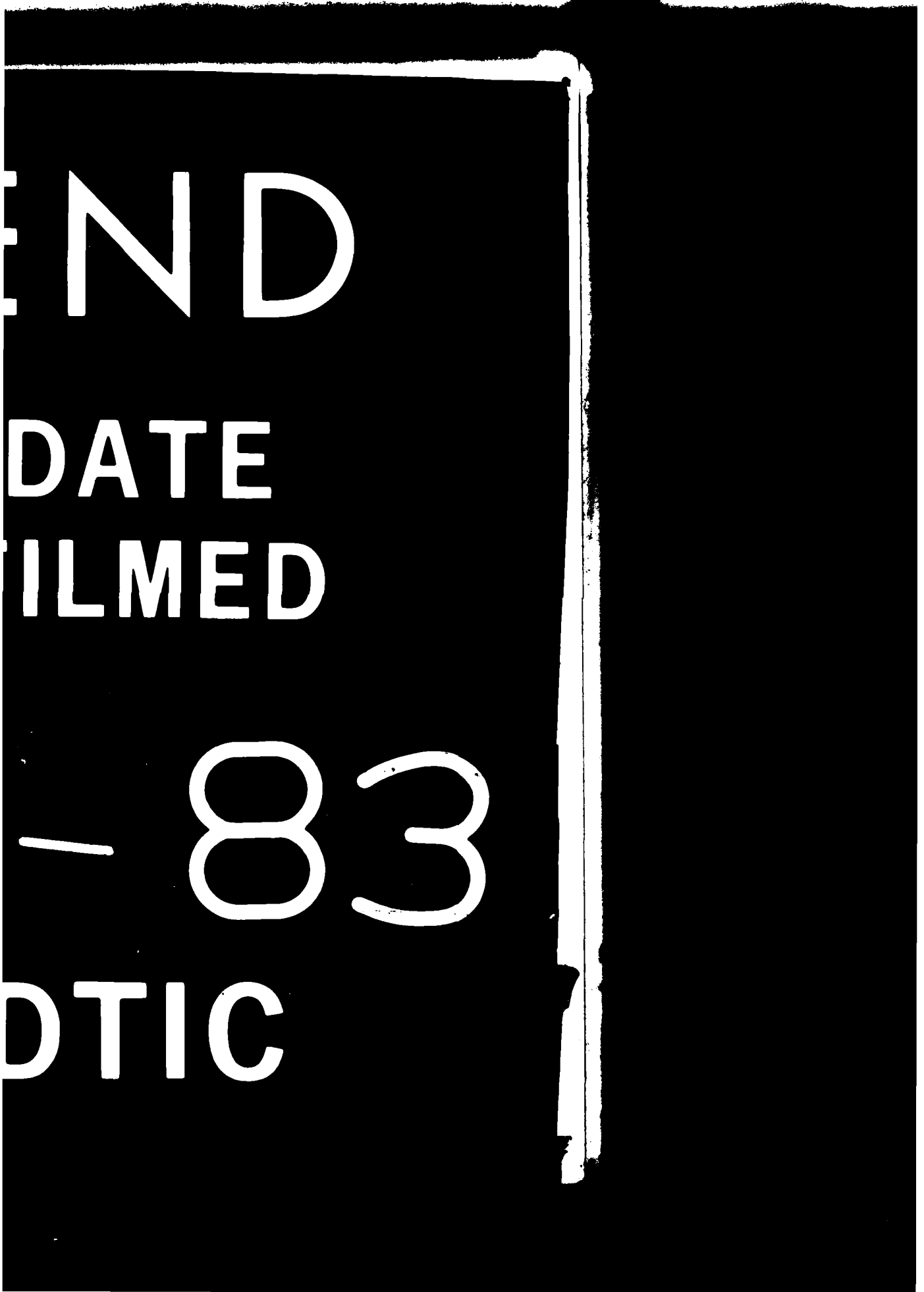
(3) Informally coordinate proposed draft standards, and try to resolve issues.

(4) Recommend proposed Federal telecommunication standards to the FTSC, including the forwarding of unresolved issues.

Internal Subcommittee Operation. The effort of each subcommittee will be directed toward accomplishing the tasks assigned in its approved work statement. In conducting the business of the subcommittee, the keeping of formal minutes and other associated documents should be kept to a

minimum consistent with the accomplishment of the subcommittee work. The subcommittee may form ad hoc committees as discussed in the Mission Statement above. Subcommittee recommendations will be transmitted to the FTSC for review and approval. When a consensus cannot be reached within a subcommittee, a majority view will form the basis of the recommendation; however, minority positions, together with their rationale, will accompany the recommendation forwarded to the FTSC. Upon completion of all assigned tasks, a subcommittee is dissolved.

Subcommittee Membership. Subcommittee membership will be drawn from the NCS Operating Agencies, and other interested agencies. Members will participate as qualified technical experts having knowledge of their agency's interest in the subject under study. Since coordination of recommendations within a committee is informal, no agency is bound by the individual views of its representatives on the committees.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